



THE PINHAS SAPIR CENTER FOR DEVELOPMENT
TEL AVIV UNIVERSITY

**Pricing a Product Line of Upgradeable
Contracts: Theory and Application
on the eBusiness Service Providers**

Sarit Markovich¹

Discussion Paper No. 7-2004

June 2004

¹ The Leon Recanati Graduate School of Business Administration, Tel Aviv University, Tel Aviv 69978
E-mail: saritm@post.tau.ac.il

1. Introduction

It has been long recognized that in order to screen potential customers and extract more value, firms can offer a product line (or a menu of contracts). For example, in general markets such as automobiles and airline travel firms target different products to different types of customers according to purchasing ability or preference for quality (also known as second degree price discrimination). In other arenas, such as credit markets, firms screen customers according to the risk of the project; in insurance markets, firms screen customers according to the risk of accident.

Pricing and designing a product line in the case of a monopoly has been studied since Mussa and Rosen (1978). In general, price discrimination theory tells us that a firm that offers a larger number of contracts can better screen its consumers and would therefore, relatively to the competitive case, price its basic contract lower and its top contract higher.¹ This pricing strategy would then allow the monopolist to extract a higher value and thus enjoy higher profits. Price discrimination theory, however, tells us nothing about the prices of the contracts in the “middle” as well as on the role of competition in the light of price discrimination strategy.

This paper analyzes the oligopolistic case, where differentiated firms compete in product lines and consumers incur costs when switching from one firm to another. We define a product line to be a portfolio of contracts where each contract upgrades (in terms of features) the basic contract the firm offers.² Under the above structure we address the following questions: How should a firm price its product line? What is the effect of the number of different contracts the firm offers on the firms' pricing strategy? Should firms take advantage of consumers' switching costs to lock them in? And finally what is the effect of competition on the pricing strategy of price discriminating firms?

The answers to these questions are not straightforward. Switching costs give firms incentives to price their basic contract very low (at costs, or even below costs) in order to lock-in the consumers, and then enjoy monopolistic power when consumers choose to upgrade their contract to a higher quality contract. On the other hand, pricing the basic

¹ We define the top contract to be the highest quality contract (the most expensive contract) the firm offers.

² We define the basic contract to be the lowest quality contract (the cheapest contract) the firm offers.

contract too low can result in attracting the low valuation, more price sensitive, consumers who will stick with consuming only the basic contracts. Furthermore, intensive competition limits the firms' ability to enjoy high margins on the high-end products and thus affects the pricing of the whole product-line.

Unlike the monopoly case, the literature on price discrimination in competitive settings is pretty thin (see Varian (1989) and Wilson (1993) for some references) and more importantly is mostly theoretical. Oligopolies were studied by Borenstein (1985) and Holmes (1989) who suggest that a firm facing a downward sloping demand curve can price discriminate even when its market power over price arises only from monopolistically competitive product differentiation. More recently, Armstrong and Vickers (2001) introduce and use the competition in utility space framework to investigate profit, consumer surplus and welfare implications of various price discrimination policies in oligopoly. They show that freedom to engage in price discrimination tends to be desirable in sufficiently competitive conditions: constraining the ways that competitive firms supply utility to consumers usually reduces total welfare.

More closely related to our paper is Schmidt-Mohr and Villas-Boas (1997) who study product line competition in markets with horizontal differentiation and show that sufficient amount of differentiation is a sufficient condition for the existence of a pure strategies Nash equilibrium. None of the above papers, however, have any empirical application.

The only empirical application we are aware of is Shepard (1991). Shepard (1991) uses micro-data on gasoline retailing to study the pricing structure in stations that offer both full-service and self-service and stations that offer only full-service or only self-service. She shows that multi-product stations price discriminate by raising the full-service prices and lowering the self-service prices.

2. The eBSP Market

In order to study the above, we study the e-Business Service Providers (eBSP) market. eBSPs offer solutions for small businesses that are interested in creating an online store or in improving their already existing online storefront.

Although the Internet boom is over, there is no doubt that a web presence is becoming a necessity for businesses of all sizes either as an information channel or as a selling channel. Nevertheless, in January 2001, IDC reported that five million small businesses and 15 million income-generating home offices still do not have a web site, and fewer than 5 percent of small businesses that are online have been selling products and services online for longer than a year. In 2001, the Small Business Administration estimated that by the end of 2002, 85 percent of small businesses would be conducting business over the Internet. This huge expected demand has resulted in a long list of e-business service providers that offer a large variety of scalable services to fit each individual business' unique needs.

eBusiness service providers offer a bundle of hosting (mainly disk space) and a storefront software which includes a store builder and a store manager. The store builder helps with creating the online store: designing the store's layout (usually from a predefined template) and recording the products characteristics: name, price, picture and quantity (most store builders require a manual entry of each and every product, while some offer automatic loading). Once the store has been created, the store manager accepts online transactions, calculates taxes, manages quantities and produces reports.

The eBSPs charge a monthly fee, which depends on the contract's hosting level as well as on the quality of the storefront software (hereafter cart). While basic contracts usually offer a small disk space together with a low quality cart, top contracts typically offer a large disk space as well as a high quality cart. Under the above structure, a small business that wants to go online but is not sure about its online scale can start with the basic contract and only if and when needed, can upgrade to a better contract with more disk space and a higher quality cart. Note that, "going online" means that the storeowner has to spend time on creating the store, uploading the data and learning how to use the software. This is a time consuming process and therefore creates high switching costs. Since when engaging with an eBSP the consumer is uncertain about the scale of its online store, the scalability of the contract is very important and therefore a small business will look at the whole product line offered by the eBSP before choosing a provider.

During 2000, before the high-tech crash, many of these providers offered their basic contract for free and charged a monthly fee only once the consumer chose to upgrade to a better contract. This behavior can be seen as an attempt to lock-in consumers, as building

the web store requires a lot of time and once putting this time in consumers would tend to stick with their existing provider rather than switch. Note however that this pricing strategy did not turn to be effective, as by 2001 the providers who offered free contracts either went out of business or moved to charging a monthly fee for all contracts.

3. Model

Consider a differentiated goods oligopoly where firms can offer either a single product or a product line. Following Mussa and Rosen (1978), we define a product line (portfolio) to be a featured-differentiated spectrum of goods of the same generic type. We allow consumers to place different valuations on the different attributes of the goods and thus although the goods are similar, consumers do not regard them as perfect substitutes. Within a portfolio, products can be differentiated by two classes of features: commodity features and advanced features. We assume that there are two types of firms which differ in the costs of producing the commodity and advanced features. Such that, while some firms find it relatively cheap to offer high-quality commodity features, others have relatively lower costs to offer high-quality advanced features. Firms, thus, have two control variables: 1) the number of different product varieties they offer along the product line and, 2) the "breadth" of the commodity and the advanced feature spectrum they offer. We let the commodity features spectrum be two-dimensional: memory size and number of slots. The advanced features spectrum is multidimensional

For each product variety, k , produced by firm of type f , we observe the vector of characteristics M_k, S_k, Q_k as well as the price $P(f, l, M_k, S_k, Q_k)$. Where M_k, S_k, Q_k are product variety k 's memory size, number of slots and advanced features respectively.³ l is the position of the product variety within the firm's product line. The consumers' utility from product k is then $U(l, M_k, S_k, Q_k, P_k)$. Since we expect consumers to find products with the same level of commodity features as closer substitutes than products with a different level of commodity features, we denote by N_c the total number of firms that offer a product variety with an overall level of commodity features equals to c .

³ M_k and S_k can take any value in between zero and infinity, $M_k = \infty$ ($S_k = \infty$) if for product variety k the firm does not limit the memory size (number of slots).

This study examines the firms' pricing strategy as a function of the position of the product variety within the portfolio, the level of commodity features, the type of the firm and the number of products with the same level of commodity features. In particular, we address questions regarding the comparative importance of the product's differentiated-features or competitive pressures on prices. We will focus on documenting evidence of departures from commodity pricing, if at all. There are several competing theories for how N_c , M_k and S_k affect the firms' pricing policy. We summarize the main ones and their forecast below.

The monopolistic case of pricing and designing a product line was studied by Mussa and Rosen (1978), who look at the case where consumers have different valuations for quality and compare the strategies of a price discriminating monopolist with the competitive solution. They find that a monopolist would offer a larger range of qualities than the range offered under competition. Furthermore, Mussa and Rosen (1978) show that for any quality sold both by the monopolist and under competition, the monopolistic mark up is higher than the competitive mark up, such that the difference in mark ups increase with the quality level of the product variety. That is, we should expect mark ups at the top of the product line to be higher than mark ups at the bottom of the product line.

This pricing strategy fits also with the lock-in literature (e.g. Klemperer, 1987), where firms price their products at the bottom of the product line relatively low in order to attract consumers. Once the consumers are locked into the firm's product line the firm can enjoy higher margins on the top product varieties. There is, however, a tradeoff in here. Pricing the bottom product variety too low might attract only low valuation consumers, who would never upgrade to higher quality products.

Note that in the price discrimination literature, firms target the higher-quality, higher-price products to the high-valuation consumers. However, as Mussa and Rosen (1978) emphasize, consumers self-select the product they purchase. Thus, if the lower-quality products are sufficiently attractive, high-end consumers may find it beneficial to buy lower-quality products rather than the higher-quality products targeted to them. That is, lower-quality products can potentially cannibalize sales of higher quality products. The literature (e.g. Mussa and Rosen, 1978; Katz 1984; Moorthy 1984) find this cannibalization problem as the primary determinant of the optimal price-quality profile. In order to mitigate the cannibalization problem, firms make lower-quality products

relatively unattractive to higher-end consumers. In particular, firms provide the top-valuation consumers with their preferred (efficient) quality and distort the qualities of all other products, such that all other consumers' types get quality levels lower than their preferred levels.

There is a large literature on where should firms locate their products (e.g., Hotelling, 1929; Shaked and Sutton, 1982). In general, these models show that by differentiating their products from those of rivals, firms reduce the level of price competition in the market. These models predict the level of product differentiation in the market as a function of the degree of price competition, demand, and the order of entry. For example, Hotelling's model (1929) show that if prices are held fixed, firms will locate their products next to each other to divide up the market. In contrast, Shaked and Sutton (1982) show that in the presence of price competition firms have incentives to differentiate themselves and to locate products far from one another. Prescott and Visscher (1977) find that in the absence of potential entry, firms locate products far from one another. Brander and Eaton (1984) show that under some circumstances managers locate new products only in certain market segments to avoid intense price competition.

Finally and very related to the literature above, there is the literature on how many variations should a firm offer, which discuss the tension between breadth and focus. The advantages to breadth discussed in the literature fall into two categories. First, product variety allows the firm to better meet the demand of heterogeneous consumers and thus increase sales (e.g. Salop 1979). Second, Schmalansee (1978) shows that by strategically preempting new market entrants, broad product lines create entry barriers.

3. Data

The eBSP market is characterized by a large number of providers offering a large variety of web solutions, starting from basic hosting and up until sophisticated store managers. In order to build a comparable set of services, this study focuses on custom Internet solutions offered to small to mid-size firms. Since we want to concentrate on custom solutions that offer online transactions in addition to help with building and managing the storefront, we dropped all observations that did not follow the following requirements: 1)

offer a store builder, 2) offer online credit card processing, and 3) do not require any knowledge in HTML/ XML or any other computer language.

Our resulting data set is basically composed of two main types of eBSPs: 1) providers whose main business is developing and selling web store solutions (hereafter self-developers) and, 2) ISPs that want to have the ability to offer their clients simple storefront services in addition to internet connections (hereafter hosting-firms). Since the storefront services are not the core business of the hosting-firms, these firms tend to buy a third party cart and sell it to their customers. Both types of providers tend to offer a choice among several contracts, each of which includes hosting services, a storefront builder and a store manager. Contracts, thus, might differ in the hosting size, the storefront options and the store manager features.

The data collection process was as follows, we first searched Yahoo! and *thelist*⁴ for listings of providers. We then, looked at each provider web site and for each contract offered collected information on monthly prices⁵ as well as on the following features:

Hosting services: Storage - the amount of disc space for all Web site files and graphics, **Products** - the maximum number of items in the online catalogue.

Cart: Templates - the number of different layouts, color schemes, and styles for the storefront display, **Inventory Control** - an inventory manager that prevents backorders and sets the quantity in stock, **Shipping Calculator** - automatically calculates the cost of shipping the products to the customer, basically based on weight and location. **Tax Calculator** - automatically calculates the tax on products shipped within the US, **Customer Report** and **Trend Reports** give an overview of activity on the store's site, such as how many pages customers visited, the average number of pages each visitor looked at, and which sites and search engines refer the visitors. These reports are used to gather information to improve the site's effectiveness. **Export Transaction Data** helps in keeping track of sales for accounting purposes, **Catalog Importer** enables the use of database, such that the store data can be uploaded from a file rather than added one by

⁴ This site, maintained by Meckler Media, provides ISPs the opportunity to advertise their services. ISPs fill out a questionnaire where the answers are partially formatted, then the answers are displayed in away that allows users to compare different ISP services.

⁵ Since in some cases the pricing quotations advertised on *thelist* turned to be inaccurate, we decided to disregard these quotes and to use only the quotations advertised on the providers' website.

one. This feature saves a lot of time and decreases the switching costs for the storeowner.

Coupons/ discount Creator creates coupons for customers to use in the store, **Site Search** – a search engine for items on the store’s site, **Saving User Profile**.

Finally, we picked a random choice of providers and called them to verify the online quotes.

3.1 Descriptive Statistics

Hosting⁶ - Hosting services provide the storeowners with a server space. The amount of disk space a store utilizes depends on the number of items the store offers as well as the graphics the store uses. A hosting contract would, therefore, specify the maximum number of items that can be stored (hereafter products), as well as the available disk space (hereafter storage). Since from the storeowner point of view, products and storage are complements, a storeowner would not value a contract with unlimited storage (products) but a very small number of products (storage) as most of the offered storage (products) cannot be used. The idea is very similar to the complementarity of RAM and processing speed (MegaHertz) in the computers’ hardware market. We know that a lot of RAM is of no value if the computer is not fast enough and vice versa. Therefore, the same way as in the computers’ hardware market consumers look for a balance in the available RAM and processing speed, we would expect storeowners to look for contracts that offer a balanced products and storage.

In the computer market, since RAM and processing speed are complements firms tend to offer products on the RAM-processing speed diagonal. This, however, is not the case with storage and products. Table 1 shows the storage-products offerings distribution. For each storage-products range combination, the table gives the number of contracts offered (top number) and the average monthly price of these contracts (bottom number).

The table shows that unlike the computers market, in our case the storage-products combinations are spread all over the storage-products space. Furthermore, the table shows that providers tend to use a limitation on one dimension of the space (storage or products) as a tool to also limit the other dimension, such that almost 60% of the contracts in our data limit only one dimension of the space, where more than 80% of these contracts offer

⁶ Hosting is a service whereby a storeowner rents a set amount of space on a high-spec server's hard drive which is connected directly and permanently to the Internet. This rented space is where the e-store's web pages are stored so that anyone who is connected to the Internet can look at them

unlimited products. Note that 10% of the available contracts offer unlimited products with a small disk space (less than 50 MB), while there are no contracts that offer unlimited storage with less than 25 products. In addition note that there is lots of variability in the pricing of the contracts, without any notable trend.

Products \ Storage	<25	26-100	101-500	501-10000	Unlimited	Total
<=50	17 <i>17.7</i>	29 <i>110.7</i>	7 <i>193.5</i>	5 <i>243.9</i>	45 <i>40.7</i>	103 <i>76.9</i>
51-150	24 <i>27.5</i>	11 <i>110.9</i>	10 <i>259.5</i>	15 <i>324.4</i>	57 <i>53.3</i>	117 <i>105.8</i>
151-300	24 <i>40.7</i>	12 <i>87.1</i>	4 <i>325</i>	13 <i>120.9</i>	54 <i>49.3</i>	107 <i>70.6</i>
301-2000	6 <i>43.1</i>	1 <i>64.95</i>	2 <i>325</i>	12 <i>259</i>	64 <i>102.6</i>	85 <i>125.3</i>
Unlimited		16 <i>134.5</i>	11 <i>285.9</i>	13 <i>416.8</i>	7 <i>55.3</i>	47 <i>236.2</i>
Total	71 <i>30.9</i>	69 <i>111.5</i>	34 <i>266</i>	58 <i>279</i>	227 <i>63.8</i>	459 <i>108</i>

Table 1: No. of Contracts and Prices in the Products=Storage Space

Carts – A cart is a combination of a store-builder and a store-manager. The store-builder software helps the storeowner with building the online store. A typical store-builder offers the storeowner several storefront templates to choose from, helps with uploading the data, categorizing the products and building a record for each product. We define the Quality of the cart to be the quality of the store-builder and the store-manager software. We have found 11 features (described above) to be important features for an online store and indicative of the software’s quality. Each cart got one point for the availability of each of these features. Thus, the resulting variable Quality takes on values in between zero to eleven. We provide descriptive statistics on the carts’ quality in table 2 below.

Our data consists of nine different third party carts and fourteen self-developed carts. Table 2 shows the distribution of the most common carts⁷ along the storage line, the products line the price line and the quality line.

⁷ constitute 90% of all observations.

Storage	Median	Median	Median	Price	Mean	Mean If	Mean If
		If	If				
Cart		Lowest	Highest			Lowest	Highest
Akopia	200	50	500		29.5	13.65	54.2
Miva	275	120	500		82.5	52.8	133
Kurant	200	50	500		255.7	65	585
Alacart	198.7	100	300		36.3	23.7	50.3
Selfdevelope	75	50	125		122.4	50.7	196.6
Branded	75	40	150		141.8	61.6	250
Products				Quality			
Cart							
Akopia	Unlimit	Unlimit	Unlimit		10	10	10
Miva	Unlimit	Unlimit	Unlimit		7	7	7
Kurant	500	50	2000		9	8	10
Alacart	25	20	100		5	5	5
Selfdevelope	500	75	Unlimit		7	6.5	7.5
Branded	150	24	2000		4	4	4

Table 2: Carts' Descriptive Statistics

Table 2 shows that, on average, hosting-firms tend to offer more storage than self-developers. The intuition behind this is pretty clear, while out of definition storage is cheaper for hosting-firms, storage is relatively expensive for self-developers. In addition, since the quality of a third-party cart is fixed, hosting-firms can offer only storage/products upgrades, while self-developers offer upgrading contracts with higher quality as well as more products/storage.

In contrast to the dispersion in the storage offering, on the products line each firm tends to offer only a specific range. In particular, Miva and Akopia offer only unlimited products while AlaCart offers contracts in the low-end of the products line. In terms of quality, Table 2 shows that AlaCart is in the low-end, Miva is in the mid of the range while Kurant and Akopia are in the high end of quality. The self-developers are found everywhere along the line.

Portfolios – We define a portfolio to be the set of all contracts a firm offers. In order to serve consumers who outgrown their current contract, firms offer two types of upgrades: 1) software upgrade - additional features to better manage the online store, and 2) hosting upgrade – additional products/storage/email accounts to expand the online store. While self-developers are free to choose their software upgrades, hosting firms are tied to the

upgrades offered by the third party cart. That is, all hosting firms that use the same third party cart will offer exactly the same software upgrades and can differentiate themselves only with the combined hosting contract.⁸ This, however, does not set apart hosting-firms and self-developers in terms of the number of contracts offered within a portfolio.

Price discrimination theory suggests that the number of contracts in a portfolio plays an important role in pricing. Table 4 shows the effect of the position of a contract within the portfolio on its price.

Variable	Obs.	Median	Mean	Std. Dev.	Min	Max
All	461	54.9	110.85	146.27	5	1025
Basic in a Portfolio	102	34.95	38.67	32.93	5	250
Basic in a 3 Plans Portfolio	22	42.47	49.65	34.57	15.95	165
Basic in a Portfolio of 4 or more Plans	54	29.95	35.25	35.97	5	250
Top in a Portfolio	102	97	177.36	221.33	15	1025
Top in a 3 Plans Portfolio	22	100	158.2	139.3	24.95	630
Top in a Portfolio of 4 or more Plans	54	111.42	241.66	271.58	16.95	1025

Table 3: Pricing within Portfolios

Table 3 shows that the average (and median) price of a basic⁹ contract in a portfolio of three contracts is higher than the average (median) price of a basic contract in portfolios of 4 contracts and more. Furthermore, the price of a top contract in a 3 contracts portfolio is, on average, lower than the price of a top contract in portfolios of 4 contracts or more. That is, the more contracts a firm offers, the lower is the initial price and the higher is the end price. This pricing behavior highly suggests the use of price discrimination theory (Shepard 1992).

Specification

⁸ Kurant is the only exception, who offers carts with two different quality levels

⁹ Recall that the basic contract is the contract with the least features that the firm offers. The top contract is the contract with most features offered by the firm.

In order to test the price discrimination hypotheses we run a hedonic price regression on features, quality, portfolios and carts. *Storage* and *Products* give the available storage space and the max number of products allowed in the store. In case of unlimited *Storage* or unlimited *Product*, the variable is set to zero and the corresponding dummy variable, *InfStorage* or *InfProducts*, is set to one. The dummy variable *InfBoth* gets one if both Storage and Products are unlimited and zero otherwise. *inbalPro (imbalStor)* is a dummy variable that get one if the contract offers more products (storage) than storage (products) in an imbalanced way.¹⁰ *Quality* is the variable defined before, while *PhoneSupport* is a variable that gets one if the monthly price includes free phone support. Phone support is a very important service especially for a new online storeowner and therefore many providers take advantage of that and charge high extras for it. If the free phone support is given only for couple of months *PhoneSupport* gets the relative fraction of these months within the first year.

For portfolios the regression uses several variables. *Low3Equal (High3Equal)* is a dummy that gets one if the contract is the basic (top) contract in a portfolio of exactly 3 contracts, while *Low4 (High4)* gets one if it is the basic (top) contract in a portfolio of 4 contracts or more. The dummy *SecondLow4-6 (SecondLow7)* gets one if the contract is the second from the bottom contract in a portfolio of 4, 5 or 6 contracts (seven or more contracts), while *SecondHigh4-6 (SecondHigh7)* gets one if the contract is the second from the top in a portfolio of 4,5 or 6 contracts (seven or more contracts).

For carts, *Akopia, AlaCart, Kurant, Miva* and *SelfDeveloped* are dummy variables of the major carts.

5. Results

Table 4 shows two specifications of the same basic regression. Column one is an OLS estimator and column two is a fixed effect estimator, both with the log of prices as the dependent variable.¹¹

	OLS	Fixed-effect
--	-----	--------------

¹⁰ For example, *inbalPro (imbalStor)* gets one if a contract offers unlimited products (storage) but only little storage (products), such that the consumer cannot actually enjoy all the products (storage) offered.

¹¹ Box-cox tests strongly favor the log price specification.

	LogPrice		LogPrice	
lnStorage	0.16	4.97	0.14	5.43
lnProducts	0.12	5.74	0.16	11.32
InfStorage	-0.59	4.65	-0.37	1.43
InfProducts	-1.63	7.85	-1.34	8.78
InfBoth	-2.51	7.71	-0.75	2.59
imbalPro	0.07	0.92	0.02	0.29
imbalStor	0.08	1.15	0.17	3.08
Quality	0.11	5.40	0.21	8.39
PhoneSupport	0.14	2.71	-2.5	1.94
Low3Equal	-0.31	2.58	-0.32	4.50
Low4	-0.56	6.38	-0.53	9.70
High3Equal	0.56	3.4	0.46	6.48
High4	0.53	6.64	0.40	7.52
SecondLow4-6	-0.24	2.91	-0.21	3.86
SecondLow7	-0.38	4.77	-0.36	5.50
SecondHigh4-6	0.10	1.25	0.10	1.80
SecondHigh7	0.52	6.94	0.36	5.58
Akopia	-1.24	11.10		
AlaCart	-0.69	7.07		
Kurant	0.60	6.89		
Miva	-0.04	0.37		
SelfDeveloped	0.09	1.00	-0.11	0.52
Constant	2.25	9.79	1.02	3.71

Fixed Effects:

sigma_u = 0.8915

sigma_e = 0.2247

rho = 0.9403

Number of obs = 461

R-sq: within = 0.8812

F(22, 438) = 149.6

between = 0.0405

Prob > F = 0.000

overall = 0.2279

R-squared = 0.8229

Root MSE = 0.4562

corr(u_i, Xb) = -0.3251

Table 4: Hedonic Regression Results

The basic patterns seen in table 3 continue to hold in here; the more contracts a firm offers, the lower is the initial price and the higher is the top price. These discounts reach 31% for three contracts portfolios and 56% in portfolios of four contracts or more. The premium for the top contract in these portfolios exceeds the 50%. Furthermore, the second from the bottom contract get discounted as well, while a premium is also charged for the second from the top contract. That is, firms seem to be tilting the whole pricing line in a way that lowers prices for basic contracts and raises prices of top contracts.

The pricing of self-developers and hosting-firms depends on the specific cart they offer. Firms that offer AlaCart, which is on the low end of the products line and quality line, discount their contracts by almost 70%. While firms that offer Kurant, which is a high quality cart, charge a positive premium. Given the above, the discount for Akopia might seem odd. Akopia is at the top of the quality line, is always offered with unlimited products and is mostly associated with attractive storage offerings. However, Akopia is an open source and eBS providers can offer this cart without being charged for it.¹² This of course gives a huge cost advantage for these providers and allows them to tremendously discount their contracts. Self-developers who were spread all over the products, storage and quality lines seem to be charging average prices. The coefficient of SelfDeveloped is positive in the OLS regressions and negative in the fixed effect ones, where in all cases the coefficient is not significant.

Competition

The discussion above is based only on price discrimination theory and therefore assumes monopolies. The eBSP market, however, is a very competitive market. We therefore move now and analyze the role competition plays in the light of price discrimination strategy. To do that, we look again at Table 1 and add in each cell the number of competing carts that sell at least 80% of the contracts within each Storage/Contracts range.

Products		<25	26-100	101-500	501-10000	Unlimited
Storage	<=50	17	29	7	5	45
	# contracts	2	2	2	2	4
	#carts	17.7	110.7	193.5	243.9	40.7
	Avg. price					
51-150		24	11	10	15	57
	# contracts	1	1	2	2	4
	#carts	27.5	110.9	259.5	324.4	53.3
151-300		24	12	4	13	54
	# contracts	1	2	1	2	4
	#carts	40.7	87.1	325	120.9	49.3
301-2000		6	1	2	12	64
	# contracts	1	1	1	2	2
	#carts	43.1	64.95	325	259	102.6
Unlimited			16	11	13	7
	# contracts		1	1	1	3

¹² On the other hand, note that this also means that the providers cannot give support for the operation of the cart.

		134.5	285.9	416.8	55.3
--	--	-------	-------	-------	------

Table 8: # contracts, # carts and prices in the Storage/Products space

Table 8 shows that while the low-end of the space is pretty thin, the high-end of the space is very crowded. This particular distribution has very important implications on the firms' pricing strategy: According to price discrimination theory, firms should enjoy high margins on the high-end contracts. However, the heavy competition on the high-end of the product space limits the firms' ability to extract high value from this segment.¹³

In each segment, firms compete both with contracts offering the same cart as well as contracts offering different carts. That is, in general, competition within segments depends on the total number of contracts within the segment, the total number of firms as well as the total number of different carts. We therefore have three measures for competition that are very much related. Furthermore, though the more crowded a segment is the more it is competitive, it is important to note that it is not clear whether the high supply is not a pure result of higher demand in these segments.

One would expect competition with contracts that offer the same cart to be harsher than competition with different carts. This, however, is not necessarily the case. Indeed, different carts provide product differentiation which should soften price competition. On the other hand, the option to offer the same cart enables firms to cooperate on prices, either independently or by having the cart's supplier setting a fixed price. In this case, we should expect to see competition between the self-developers within the same segment but not between hosting-firms that offer the same cart.

In order to study the effect of competition on the firms' pricing strategy, we define the following additional variables: **Location** – the location of a contract within a portfolio. **packLow (packHigh)** a dummy variable that gets one if the contract is the basic (top) contract of a portfolio. **marketSize** – the total number of contracts offered within the segment. **boxNcarts** – the overall number of carts competing within a segment. **boxNsameCart** – the number of contracts within a segment that offer the same cart as my cart. **boxNsameCartSelf** – given that I'm a self-developer, the number of contracts offered within the segment by self-developers.

¹³ We define each box in table 8 to be a segment.

	LogPrice		LogPrice	
Constant	1.89	8.86	1.97	7.56
lnStorage	0.2	7.63	0.18	6.41
lnProducts	0.12	6.6	0.13	6.72
InfStorage	-0.7	-4.87	-0.67	-4.37
InfProducts	-1.3	-8.73	-1.1	-5.37
InfBoth	-2.3	-9.36	-1.97	-6.86
Quality	0.1	5.39	0.1	5.27
PhoneSupport	0.14	3.05	0.16	3.41
Akopia	-1.35	-12.54	-1.48	-12.55
AlaCart	-0.79	-8.36	-0.81	-8.44
Kurant	0.42	4.11	0.4	3.86
Miva	-0.007	-0.08	-0.14	-1.4
SelfDeveloped	0.11	1.18	0.47	2.34
packLow	-0.51	-3.98	-0.51	-3.96
packHigh	0.39	2.99	0.34	2.64
Location	0.97	6.29	0.1	6.7
marketSize			0.008	1.16
boxNcarts			-0.09	-2.08
boxConSameCart			0.02	2.33
boxConSameSelf			-0.14	-1.85
imbalProSto				
topSegment				

Number of obs	= 459		
F(15, 443)	=131.7	F(19,439) = 106.9	F(21,437) =
98.98			
Prob > F	= 0.000	= 0.000	= 0.000
R-squared	= 0.817	= 0.82	= 0.83
Root MSE	= 0.456	= 0.451	= 0.447

Table 5: Hedonic Regression Results

Basically, the results found in table 4 still hold: firms tend to discount the bottom contract and to charge a premium for the top contract. In addition, the higher is the product within the portfolio the higher is its price. Competition seems to have negative effect as long as firms do not cooperate. boxNCarts is negative and significant suggesting that prices decrease with the number of firms. As for competition within firms that offer the same cart, there are two interesting effects. The self developers market seems to be fragmented and indeed boxConSameSelf is negative and significant suggesting that as the number of self-developers within a segment increases the competition in between these contracts

decreases prices. On the other hand, the third party carts market seems to be more coordinated. The coefficient for `boxConSameCart` is positive, suggesting that either independently or with the help of the cart's supplier, firms offering the same third-party cart manage to keep their prices high. `marketSize` is positive but not significant.

References

- Armstrong, M. and J. Vickers (2001), "Competitive Price Discrimination," *RAND Journal of Economics*, 32(4), 579-605.
- Brander, J. A. and J. Eaton (1984), "Product Line Rivalry," *American Economic Review*, 74(3), 323-334
- Borenstein, S. (1985), "Price Discrimination in Free-Entry Markets," *RAND Journal of Economics*, 16(3), 380-397.
- Holmes, T. J. (1989), "The Effects of Third Degree Price Discrimination in Oligopoly," *American Economic Review*, 79(1), 244-250.
- Hotelling, H. (1929), "Stability in Competition," *Economic Journal*, 39:41-57.
- Katz, M. L. (1984), "Price Discrimination and Monopolistic Competition," *Econometrica*, 53, 1453-1472.
- Klemperer, P. (1987), "The Competitiveness of Markets with Switching Costs," *RAND Journal of Economics*, 18:138-150.
- Moorthy, S. (1984), "Market Segmentation, Self-Selection, and Product Line Design," *Marketing Science*, 3, 288-307.
- Mussa, M. and S. Rosen (1978), "Monopoly and Product Quality," *Journal of Economic Theory*, 18, 301-317.
- Prescott, E. C. and M. Visscher, (1977), "Sequential Location among Firms with Foresight," *Bell Journal of Economics*, 8(2), 378-393.
- Salop, S., (1979), "Monopolistic Competition with Outside Goods," *Bell Journal of Economics*, 10, 141-156.
- Schmalensee, R., (1978), "
- Shaked, A. and J. Sutton (1982), "Relaxing Price Competition through Product Differentiation," *Review of Economics Studies*, 49, 3-13.
- Schmidt-Mohr, U. and J. M. Villas-Boas (1997), "Competitive Product Lines," *mimeo*.

- Shepard, A. (1991), "Price Discrimination and Retail Configuration," *Journal of Political Economy*, 99(1), 30-53.
- Varian, H. R. (1989), "Price Discrimination," in R. Schmalensee and R. D. Willig, eds., *The Handbook of Industrial Organization*, Amsterdam: North-Holland.
- Wilson, R. (1993), *Non Linear Pricing*, New York: Oxford University Press, 1993.